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DESCRIPTION

OF THE REMAINS OF

EXTINCT MAMMALIA AND CHELONIA,

FROM NEBRASKA TERRITORY,

COLLECTED DURING THE GEOLOGICAL SURVEY UNDER THE
DIRECTION OF DR. D. D. OWEN.

BY JOSEPH LEIDY, M.D.,

OF PHILADELPHIA.

BIBLIOTHECA
REGIA
MONACENSIS

TO DAVID DALE OWEN, M.D.,
UNITED STATES GEOLOGIST.

SIR: In the accompanying Memoir will be found a description of the fossil Mammals and Reptiles collected in the Mauvaises Terres of Nebraska, during the Geological Survey made under your direction, and which you submitted to me for examination.

Yours, &c.,
JOSEPH LEIDY.

DR. LEIDY'S MEMOIR.

THE region of Nebraska Territory of the United States appears to be as rich in the remains of Mammalia and Chelonia of the Eocene period as the deposits of the same age of the Paris basin. Dr. Hiram A. Prout of St. Louis, described the first mammalian fossil from Nebraska, in the American Journal of Science for 1847. The specimen indicates a species of Palæotherium, or of a closely allied genus of gigantic size, and has been named after its discoverer, Palæotherium Proutii, *Owen, Norwood*, and *Evans*. Since the account of this fossil was published, an extraordinary number of beautiful and highly important specimens, of new species and genera of extinct Mammalia and Chelonia have been derived from the same locality, through the combined influence and labours of Messrs. Joseph and Thaddeus Culbertson, Professor Baird, Drs. D. D. Owen, Norwood, and Evans, and Dr. H. A. Prout and Professor O. Loghland. The most valuable collection, obtained by Dr. Owen's survey, forms the basis of the following descriptions, and comprises numerous specimens of eight species of six genera of Mammalia, and four species of the chelonian genus Testudo.

All the genera of Mammalia are distinct from those now in existence, and half of the number are new to Palæontology.

Among all the specimens which have come under my observation from Nebraska, one only belongs to a true carnivorous animal, and this is the Machairodus primævus, *Leidy* and *Owen*.

All the other mammalian fossils belong to the order Pachydermata, as Palæotherium and Rhinoceros, or to this order combined with ruminating characters, as in the case of Oreodon and Eucrotaphus; or to the same order in combination with decided carnivorous characteristics, as in the Archæotherium.

Most of the bones and their fragments are in a relatively good state of preservation, and are highly mineralized. Those of smaller animals are less fractured and mutilated than those of larger animals. The latter in many cases are crushed, while the fragments still retain their relative position, and the interstices filled with mineral matter, indicate that they have been submitted to great pressure or violence, while embedded in the deposit in which they are found when this was in a soft state, or in the condition of mud.

The specimens are very dense, and in many of them the Haversian canaliculi and areolæ, and in the case of the long bones the medullary cavities, are filled partially or completely with silex. In the latter positions, the silex is sometimes beautifully crystallized, or has a botryoidal, chalcedonic arrangement.

The change which has taken place in the chemical constitution of these fossilized bones has been determined through analysis by Dr. Owen, and is given in his report.

OREODON. *Leidy.*

(Tab. x., 4-6; xi. 2, 3; xiii., 3-6.)

In Volume IV., page 47, of the Proceedings of the Academy of Natural Sciences of Philadelphia, I described a fragment of an upper and lower jaw, from the Bad Lands of Nebraska Territory, presented to the Academy by Mr. Joseph Culbertson. The former fragment contained the two posterior molars, the latter the three posterior molars, and upon them was characterized the new genus and species Merycoidodon Culbertsonii. In 1851, I received from Professor Baird of the Smithsonian Institution, and Dr. Hiram A. Prout of St. Louis, several fragments of skulls and jaws from Nebraska Territory, having the same form of true molar teeth characteristic of Merycoidodon; but being misled by a fragment of a face of a young animal containing a portion of the first permanent premolar, followed by the entire first, and a portion of the second deciduous premolars, and portions of the deciduous true molar, and first permanent true molar, in a verbal communication to the Academy,* I stated that the specimens belonged to two other distinct genera, to one of which the name Oreodon was applied, of which two species were designated: *O. priscum*, and *O. gracile;* to the other, that of Cotylops, distinguishing the species as *C. speciosa*. All these have since been satisfactorily determined to belong to two species of one genus, for which I propose to retain the name Oreodon, as being less exceptionable than that of Merycoidodon; for it will be observed, from the anatomical details presented in the succeeding pages, that the animal was a true Ruminant, and did not merely resemble one in the form of its true molar teeth.†

The abundance of remains of Oreodon found associated with those of Palæotherium, Rhinoceros, Machairodus, etc., in the Eocene formations of Nebraska, lead to the impression that it completely replaces the Anoplotherium of Europe. We have in possession, and belonging to the collections of the Smithsonian Institution, Dr. D. D. Owen of New Harmony, Indiana, and Dr. Hiram A. Prout of St. Louis, Missouri, crania and fragments of crania, and jaws with teeth, more or less perfect, of at least twenty-six different individuals of at least two distinct species of Oreodon. From this abundant material we are enabled to trace out almost all the anatomical details of the head of the animal, which I shall do without the unnecessary reference to particular specimens in the course of the description.

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* Proc. A. N. S., vol. v. p. 237.

† After detecting the error just related, it was some consolation to me to find that even some of the most distinguished of modern anatomists have been misled under exactly similar circumstances, to the special cases of which I think it needless to refer.

The head in its general form (Tab. x., 4–6; xi., 2, 3), resembles more that of the Camel than of any other existing Ruminants. It has an almost unbroken arch of teeth in both jaws, composed of molars, canines, and incisors. The head of one of the species of Oreodon is about the size of that of the Wolf of Pennsylvania; the other is about the size of that of the Badger. To the former I have given the name of *Oreodon Culbertsonii*, to the latter that of *Oreodon gracile*. The characters common to both the species mentioned, I shall now proceed to give in detail as belonging to the genus, and afterwards point out the specific differences in addition to the size.

Side view of the skull.—(Tab. x., fig. 5; xi., fig. 2.) The temporal fossa is constructed like that of the Camel, and is relatively about as large as in that animal. It rises to the middle line of the cranium, upon a parietal crest extending the whole length of the single parietal bone. Posteriorly, it is bounded by an oblique ridge, separating it from the occipital surface. Antero-superiorly, it is bounded by a slight ridge running outwards upon the post-orbital process. The surface generally is convex, is most prominent along the course of the squamous suture, and nearly one-half of its extent is constituted by the squamous portion of the temporal bone, as in the Camel and Lama.

In some of the specimens, the parietal bone along the course of the squamous suture and contiguous to it is depressed into a groove.

The zygomatic arch is relatively much broader and stronger than in any existing Ruminants.

The malar bone is robust, and its outer surface presents upwards and forwards, or is on the same plane with the orifice of the orbit.

The post-orbital process is united, as in existing Ruminants, with the malar bone, so as to form a narrow arch.

The orbital entrance is subrotund, and is directed forward to about the same extent as in the Deer, but in a trifling degree more upward.

The face at its lower part, in comparison with that of the Deer, appears not only shortened to an extent equal to the vast unoccupied space anterior to the molars in the latter animal, but appears also to recede so as to bring the last molar on a line perpendicular to the post-orbital arch.

The face, from the latter on each side forwards, forms an almost equilateral triangle. Its sides are more vertical than in the Deer, and form a continuous convexity from the middle nasal suture downwards.

The most remarkable feature in the lateral view of the face is the very large lachrymal depression, which is nearly hemispherical, and extends slightly beyond the borders of the lachrymal bone.

The infra-orbital foramen is situated above the third premolar tooth.

The anterior extremity of the floor of the nose constituted by the superior incisive alveoli is convex, and resembles more that of the Anoplotherium than of any existing Ruminants.

Superior view.—(Tab. x., fig. 6.) In this view of the skull it resembles in its form more that of the Wolf than of any existing Ungulates. The parietal crest is relatively about as high as in the Camel. It bifurcates at the coronal suture into the ridges bounding the temporal fossa upon the post-orbital processes.

The forehead is relatively narrower than in the Deer, but broader than in the Wolf, and is more convex than in either.

Upon each side of the frontal suture, and nearer the anterior than the posterior extremities of the frontals, is a large supra-orbital foramen. The form of the muzzle in advance of the orbits is like that of the Musk-deer, except that it is more convex laterally.

The anterior extremity of the nasal bones is broken away in all the specimens, so that the form of this portion of the face cannot be ascertained.

Posterior view.—The occipital surface is intermediate in form to that of the Musk-deer and Wolf, and is smoother and relatively narrower than in the latter. Its lateral margin separating it from the temporal fossæ, is formed above by the conjunction of the parietal and occipital bones, and below, as in recent Ruminants, by the combination of the posterior temporal crest with a superficial process of the petrosa, wedged in between the former and the corresponding margin of the occipital bone.

The occipital condyles have very much the same form and relative position to each other that they have in the Deer, but are narrower and more prominent inferiorly.

The occipital foramen is rather transversely oval, with nearly vertical sides, and emarginate above. Its inferior margin between the condyles is placed more posteriorly in its relation to the superior margin than in the Deer, so that the foramen is directed more backward.

Inferior view.—(Tab. x., fig. 4.) The basilar process is prismoid, very much depressed laterally from the level of the occipital condyles, with the sides looking outward, and the middle prominent. The surface of the sphenoidal bodies incline very gradually upward and forward.

The para-mastoid process forms the infero-lateral termination of the occiput, and relatively to that of recent Ruminants is very long and strong. It is elongated pyramidal, bent a little forward and outwards, and is longitudinally excavated antero-externally.

The mastoid process forms the posterior boundary of the meatus auditorius externus, and projects downwards between the auditory process and the inferior extremity of the occipital process of the os petrosa.

The os tympanica is moderately developed, and abuts posteriorly against the base of the para-mastoid process. The stylo-mastoid foramen occupies the same relative position as in the Deer, and internal to it is a depression for the styloid process. Internal to the auditory capsule, is a large depression, corresponding to the foramina lacera anterius and posterius.

Just posterior to the foramina lacera, and internal to the base of the para-mastoid process, is the anterior condyloid foramen, and anterior to the former, just external to the root of the pterygoid processes, is the foramen ovale.

The glenoid surface is one of the most important features of the skull in reference to the habits of the animal. It is broad, and relatively flat, as in existing Ruminants. Posteriorly, it is bounded by a relatively, very large, post-glenoid tubercle, which is transversely compressed conoidal, and more prominent inferiorly than the auditory capsule. The anterior two-thirds of the glenoid surface is slightly convex, and directed more forward than in the Deer. Internally, it possesses great extent, and is continuous with a large surface of origin for the pterygoid muscles. At the base of the post-glenoid tubercle, the surface is slightly concave, and at its external part, is directed a little more outwards than in the Deer.

The pterygoid processes, with the vertical plates of the palate bones, are very much more prolonged than in the Deer, and are stronger, especially at the borders of the palatine notch. The latter is narrow, and extends as far forward as the posterior third of the last molar tooth. The posterior palatine foramina are situated in the plates of the superior maxillary bones, anterior to the position of the true molars, and usually on a line with the fourth premolar. The two sides of the hard palate have more or less disposition to incline towards each other about the centre, in some cases being much depressed in this position, but in others not so much so.

The position of the incisive foramina cannot be exactly ascertained, but they appear to exist on a transverse line with the canine teeth.

Orbits.—The inner wall of the orbit is but slightly concave compared to that of the Deer, and at the inner canthus is bounded by a compressed mammillary, lachrymal process. Within the latter are two unequal lachrymal foramina.

Between the floor of the orbit and the lachrymal bone above, is a large, transversely oval foramen: the entrance of the infra-orbital canal.

The spheno-orbital foramen, including the homologue of the foramen rotundum, is large, and vertically oval, and is situated just within the anterior angular termination of the surface of origin for the pterygoid muscles.

The foramen ovale is placed a short distance in advance of the os petrosa, to the outside of the commencement of the pterygoid process, and is almost half the size of the preceding foramen.

Relations of the Bones of the Skull.—The occipital bone posteriorly is trilateral, with a broad, prominent apex, as in the Camel.

The lambdoidal suture ascends from the base of the para-mastoid process backwards between the occipital and posterior process of the pars petrosa, to the summit of the latter, when it advances on the side to the top of the skull, between the pars squamosa, parietal, and occipital bones.

The parietal bones form but a single piece, and are remarkable, as in the Camel, on account of their relatively very great length, when compared to those of other recent Ruminants. They are narrowest posteriorly, and are prolonged on each side downwards in advance of the pars squamosa, to join the wing of the post-sphenoid. Anteriorly, they are deeply notched for the reception of the posterior extremities of the frontals.

The latter remain separated throughout life, and relatively to those of most recent Ruminants, are very short.

The nasal bones are of nearly uniform breadth, and posteriorly are received in a deep angular notch of the frontals.

The palate plates of the palate bones advance as far as a line transverse to the first true molars, or even a little anterior to them.

The intermaxillary bone is very much shorter than that of existing Ruminants, or even that of Carnivora, to which it has a strong resemblance at its lower part. Its process upwards is short, and is received by the apex into a notch of the superior maxillary bone, and, so far as can be ascertained in the specimens, does not come in contact with the nasal bone.

Inferior maxilla.—(Tab. x., fig. 5.) The lower jaw of Oreodon resembles more that of the Hog in its general form than of any of the existing Ruminants, excepting that the canine and incisive alveoli retain an upward direction like the molars.

The body of the lower jaw is relatively deeper than in the Deer, and its base is more nearly straight. Its outer side is vertical, and very slightly convex. Anterior to the mental foramen, which is placed just below the second premolar, or the interval between it and the first, it rapidly converges to the symphysis. The latter is deep, and forms a strong slope, but approaches the vertical line even more than in the Hog.

The alveolar margin ascends so rapidly posterior to the fourth premolar, that the body of the jaw behind the last true molar is more than half as deep again as it is below the former tooth.

The ramus is very broad, and vertical externally. At its upper part, below the post-coronoid notch, it is deeply depressed relatively to the condition of the same part in existing Ruminants.

The posterior margin of the lower jaw, a short distance below the condyle, in conjunction with the angle and bottom of the ramus forms a thick, strong convexity, prominent backwards and downwards, and also elevated externally for the attachment of the masseter muscle.

The coronoid process is almost as short as in the Hog, and the condyle has the same relative position to its base as in the latter animal.

Dentition.—The formula of the permanent dentition of Oreodon is,—in. $\frac{3,3}{4,4}$, can. $\frac{1,1}{1,1}$, premol. $\frac{4,4}{3,3}$, mol. $\frac{3,3}{3,3}$, $= 44$.

The superior molar teeth (Tab. x., 4, 5; xi., 2, 3) on each side, internally, are nearly parallel. They form a continuous row, and are separated from the canines by a hiatus, not greater than the antero-posterior diameter of the first premolar, for accommodating the inferior canine.

Laterally the superior incisors are in contact with the canines, but in some cases are separated by a slight hiatus. They project vertically downwards, and are arranged in the tangent of a considerably greater circle than that of the Wolf.

The inferior molars are also very nearly parallel on both sides. They form a continuous row, with the canine included. Anterior to the latter, between it and the incisors, is a hiatus for accommodating the superior canine, but less in size even than that behind the last-mentioned tooth.

The inferior incisors are oblique in their direction, but relatively not quite so much so as in the Musk-deer, and on both sides they are arranged in the tangent of a smaller circle than the upper ones.

The true molars in both jaws have the same relation to one another as in the Deer.

The first premolar of the upper jaw has its posterior margin a little external to the contiguous margin of the succeeding tooth, as if it had been pushed outwards and backwards, in a jaw where but little space could be lost, to make the hiatus between it and the canine.

In the same manner, in the lower jaw, the latter tooth and the first premolar appear pushed a little outwards and backwards in their relation to each other and the succeeding molar, so as to allow the formation of the hiatus anterior to the canine.

The crowns of the superior true molars are composed of four simple, pointed, symmetrical, pyramidal lobes, as in Merycopotamus. In comparison with existing Ruminants their form is most like those of the Deer, but they are more expanded, and consequently are relatively of greater transverse breadth, more square, and the interlobular depressions are more shallow.

The outer lobes are not separated from one another as in Merycopotamus, but are connected by a prominent buttress projecting externally, as in Anthracotherium. The remaining anterior and posterior margins of the outer lobes are also prominent externally, and with the exception of the posterior margin of the postero-external lobe of the first and second teeth, form buttresses nearly or quite as large as the middle one. The buttresses are laterally compressed, and expand towards their base, where they become confluent by means of a basal ridge passing between them. The latter ridge is sometimes obsolete, especially at the base of the postero-external lobes of the posterior two molars.

The external faces of the outer lobes are concave from side to side, slightly prominent in the middle line, and incline at an angle of about 40°. The internal faces are nearly vertical, but incline slightly outwards, and are angularly convex.

The external faces of the inner lobes are concave, and have the same degree of inclination as the corresponding faces of the outer lobes. The internal faces are convex, and less angular than those of the outer lobes.

The summits of the lobes are crescentic ridges elevated into a point at their middle. The extremities of the outer crescents rest upon the external buttresses. The anterior extremity of the antero-internal crescent, and the posterior of the postero-internal crescent, are continuous with a short ridge descending to the summit of the corresponding buttresses of the outer lobes. The anterior horn of the postero-internal crescent ends abruptly between the postero-external lobe, and the posterior horn of the antero-internal crescent, which also terminates abruptly, but is bent forward and ceases short of the posterior portion of the inner face of the antero-external lobe.

A basal ridge exists anteriorly and posteriorly upon the internal lobes, sometimes continuous internally at the base of the postero-internal lobe of the second and third molars, more frequently in the latter only than in both. Between the internal lobes the ridges occasionally conjoin and form a common intervening tubercle.

When the enamel summits of the lobes of the true molars are worn off, the exposed dentinal surface of the outer lobes presents the form of W, or two crescents continuous, that of the inner lobes of two distinct crescents.

The crown of the fourth premolar is composed of two pyramidal lobes, like those of the true molars but much larger.

The crowns of the anterior three premolars are single, three-sided pyramids with a pointed apex decreasing in size from the third to the first, and nearly alike in their details. Their outer face is broad and condiform, less concave and more vertical than in the succeeding teeth. The two inner sides are separated by a prominent angle in the middle line.

The postero-internal face is excavated into a broad cul-de-sac, the antero-internal face into two smaller culs-de-sac.

The true molars are implanted by four roots, the third and fourth premolars by three roots; two external and one internal, and the anterior two premolars each by two roots.

The inferior true molars (Tab. x., fig. 5; xiii., 3–6) have nearly the same size and form of those of Cervus Virginianus. The outer lobes are less oblique in their relative position to one another than in the Deer, and are broader at base externally, but become more tapering towards the apex. Their inner face is concave, and much more shallow than in the Deer, but gains in breadth what it loses in depth. The crescentic summits of the outer lobes of each tooth at their contiguous extremities, become continuous.

Anteriorly and posteriorly the true molars possess a basal ridge, and between the outer lobes of each tooth the latter constitutes a broad pyramidal heel.

The internal faces of the inner lobes present three folds, as in the Deer, but the posterior marginal fold is shorter, thicker, and more divergent backward from the base.

The fifth lobe of the posterior molar is more simple in form, and more distinct from the adjoining lobes than in the Deer. In transverse section it is a broad ellipse, and has an acute U-shaped summit.

In the attrition to which the true molars are subjected, the acute enamelled summits of the pyramidal lobes soon give way to crescentic surfaces of exposed dentinal substance, which gradually increase in breadth, or the crowns are worn down, until finally the whole enamelled triturating surface is obliterated. The crowns of the inferior three premolars are quite peculiar in their form. Exteriorly they bear considerable resemblance to those of the Deer, but do not exhibit the deep vertical depression so conspicuous in the teeth of the latter. Internally, they are much less complex than in the animal just mentioned.

Each premolar is constituted principally by a single broad pyramidal lobe, very much longer than that of the true molars. The anterior portion of their outer side is continuous obliquely inwards, so as to bring the anterior margin within the position of the preceding tooth posteriorly. The summit separating the outer from the inner side, is an acute ridge rising to a point.

The middle portion of the inner side of the third premolar is constituted by a pyramidal process, nearly as high as the apex of the principal lobe, with which it is continuous. Posteriorly, the inner side of this tooth has a quadrilateral cul-de-sac, bounded internally by a short pyramidal tubercle. The surface of the anterior portion of the inner side is depressed.

The second premolar internally presents a ridge descending from its apex a little backwards, and expanding along the base of the crown. Anteriorly and posteriorly to the ridge, the surface is depressed, and the ridge sends an offset backwards, which terminates abruptly about the centre of the posterior depression.

The first premolar presents a ridge similar to that existing in the second, but much less developed, and without the posterior offset.

The inferior molars are inserted by two roots, except the last, which has three, like in existing Ruminants.

The canine teeth of Oreodon are quite peculiar in form, and are about the same length in both jaws.

The superior canines curve forward, downward, and in a less degree outward. Those of the male are a little more robust, and are directed more externally than in the female. Their crown is a trihedral pyramid, with acute margins and a pointed summit. The sides are nearly equal, being posterior, antero-internal, and external, and are smooth. The posterior side is opposed to the anterior margin of the corresponding tooth below.

The inferior canines are straight, occupy a position posterior to those above, and take a course obliquely upwards, forwards, and outwards. The crown is a broad, transversely compressed pyramid, with an inner and outer convex side; an anterior trenchant margin, opposed to the posterior surface of the canine above, a posterior trenchant margin, and a pointed summit.

Of the three superior incisors on each side, the internal is the smallest, the other two being nearly equal in size. The outer face of their crowns is convex, and nearly ovoid in outline.

Of the inferior incisors, the internal of each side is also the smallest; the succeeding two are nearly equal in size, and the lateral, or fourth incisor, is a fifth larger than those last mentioned. The outer face of the three mid incisors is convex and oblong quadrilateral; and that of the fourth incisor is also convex, but is more trapezoidal in its form.

Temporary dentition.—The deciduous teeth of Oreodon, so far as can be ascertained, are as follow: in. $\frac{?}{?}$ can. $\frac{1-1}{1-1}$ p. m. $\frac{2-2}{2-2}$ m. $\frac{1-1}{1-1}$.

The first permanent premolar of the upper jaw appears to have no temporary predecessor. The superior true deciduous molar is exactly like the permanent true molars in form, and is about one-sixth smaller.

The crown of the second premolar is composed of three pyramidal lobes; two posterior and transverse, the other anterior and opposite the former.

The first premolar in form is very nearly like its successor.

In the lower jaw, the deciduous true molar has six pyramidal lobes in three transverse pairs, as in existing Ruminants, etc., and the true premolars have the same form as their permanent successors.

SPECIES OF OREODON.

OREODON CULBERTSONII. *Leidy.*

(Tab. x., figs. 4, 5, 6; xiii., figs. 3, 4.)

Merycoidodon Culbertsonii: Proc. Acad. Nat. Sci., vol. iv. p. 47; pl. figs. 1–5.
Oreodon priscus: ib., vol. v. p. 238.
Cotylops speciosa, ib., p. 239.

Of this species, the head of which is about the size of that of the Newfoundland dog, there are the following specimens in the collection of Dr. Owen.

1. A nearly entire head, wanting only the end of the nose, incisors and their alveoli, upper canines, the right zygoma and post-orbital arch, a small portion of the left zygoma, the posterior two-thirds of the sagital crest, and the angle of the right side of the lower jaw, to be complete. (Tab. x., 5, 6.) From its relation of size with the specimen next designated, it is presumed to be the head of a female.

ADMEASUREMENTS.*

	Lines.
Breadth of face at infra-orbitar foramina, ...	18¼
" " above first premolars, ...	15
Height of face from infra-orbitar foramina to ends of anterior angular processes of os frontis, ...	16
Breadth of nasal bones at the ends of the latter processes, . . .	8¼
Length of series of superior molars, ...	40½
" " inferior "	40
" " superior true molars, ...	22
" " inferior " "	24½

2. A skull (Tab. x., 4), accompanied by a small fragment (Tab. xiii., 4) of the right side of the lower jaw, containing the three true molars broken. The former has the end of the nose, zygomæ, and occipito-sagital protuberance broken away. The forehead is somewhat crushed, but otherwise, excepting fractures, without displacement of fragments, the specimen is pretty perfect. It contains all the molar teeth of both sides, the left canine, and the root of the right.

From the greater degree of robustness of this specimen, compared with that indicated in Number 1, it is presumed to be of a male individual.

The face is more flattened above, and its transverse section has a more square appearance than in the female.

The molar teeth are more robust than in the latter, and the canines are also more robust and project more outwardly.

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* A short table of admeasurements is appended to the description of each specimen, so as to present the extent of variation in size in different individuals of the species.

ADMEASUREMENTS.

	Lines.
Breadth of face at the infra-orbitar foramina,	19½
“ “ above first premolars,	19½
Height of face from infra-orbitar foramina to angular processes of os frontis,	16
Breadth of nasal bones at latter processes,	10
Length of series of superior molars,	43½
“ “ true “	23½

3. A face, apparently of a male, containing all the molars of both sides, except the first premolar.

ADMEASUREMENTS.

	Lines.
Breadth of face at infra-orbitar foramina,	19½
“ “ above first premolar,	19½
Height of face from infra-orbitar foramina to angular processes of os frontis,	14
Length of series of molars,	41

4. A fragment of a face and forehead.

ADMEASUREMENTS.

	Lines.
Breadth of face at infra-orbitar foramina,	17½
“ “ first premolar,	16¾
Height from infra-orbitar foramina to anterior angular processes of os frontis,	12½
Breadth of nasal bones at the latter processes,	11

5. A fragment of a face and forehead of an individual just reaching adult age, containing on one side the permanent true molars protruded, and fragments of the second and third permanent premolars, which were just on the point of eruption.

6. A fragment of the face of a young animal containing on both sides portions of the temporary molars, the two succeeding permanent true molars fully protruded, and the last true molars concealed within the jaw.

7. The greater portion of a face and lower jaw, containing all the molars except one.

ADMEASUREMENTS.

	Lines.
Breadth of face at infra-orbitar foramina,	20
Height “ “ “ “ to angular processes of os frontis,	16
Length of series of superior molars,	20
“ “ inferior “	22

8. A head of a young animal, with the right side of the lower jaw and angle of the left, the zygoma, end of the nose and right superficial portion of the face, broken away. The right upper and the left lower jaw contain all the molars nearly perfect, consisting, in the former, of the first permanent (?) premolar,

the deciduous molars, and the succeeding two permanent true molars, fully protruded, and the last yet concealed within the jaw; in the latter, the deciduous and permanent true molars, except the last, which had not yet protruded, form the series.

9. An inferior canine tooth with the anterior half of its crown worn down.
10. Nine fragments of upper and lower jaws of eight different individuals, containing true molars.

ADMEASUREMENTS OF THE HEAD OF OREODON CULBERTSONII.

	Lines.
Estimated length of the male head, from the occipital condyles to the incisive alveoli,	93
Estimated length of female head,	88
Greatest breadth of head at the zygomæ,	50
Breadth at infra-orbitar foramina,	19
Estimated length of sagittal crest,	34
Length of upper molar series,	40
" lower " "	39

OREODON GRACILIS. *Leidy.*

(Tab. xi., figs. 2, 3; Tab. xiii., figs. 5, 6.)

Oreodon gracilis, Proc. Acad. Nat. Sci. of Philad., vol. v., p. 239. Merycoidodon gracilis, (*Syn.*)

This species was characterized first in a verbal communication to the Academy of Natural Sciences, in 1851.

It is relatively small, the head being about the size of that of the Red Fox.

In Dr. Owen's collection are contained the following specimens of O. gracilis.

1. A cranium and face, with the base of the former and the nasal extremity of the latter broken away. The specimen contains the true molars and the last premolar entire upon the right side, and fragments of all the others. (Tab. xi., 2, 3.)
2. A fragment of a face, containing on the left side the posterior two true molars. It agrees with the corresponding portion of Number 1.
3. The head of a young individual, with the posterior and upper portions of the cranium, nose, and left side of the lower jaw broken away. The deciduous molars had not been shed, and the last true molar remains entirely concealed within the jaw.

Comparison of Oreodon Culbertsonii and O. gracilis.—Besides the great disproportion in size of the two species, there are a few other differences to be indicated.

In O. Culbertsonii the sagittal crest rises in a pyramidal manner gradually from the sides of the temporal fossæ, but in O. gracilis, appears only as an abruptly elevated roughened line at the conjunction of the parietal bones. The posterior extremities of the nasal bones are angular in the former, but convex in the latter. The lachrymal depression is not quite so deep relatively in O. gracilis as in O. Culbertsonii, and the orbital entrance is more nearly circular in that than in this.

The ossa tympanica are also more inflated in O. gracilis.

Upon the teeth of the latter the enamel is thinner relatively upon the external concave faces of the inner lobes of the upper molars, and the internal faces of the outer lobes of the lower molars than in O. Culbertsonii.

ADMEASUREMENTS OF THE HEAD OF O. GRACILIS.

	Lines.
Estimated length from the summit of the inion to the incisive alveoli,	56
Breadth at the maxillo-malar suture below the orbits,	29
Breadth at infra-orbitar foramina,	12
Estimated length of sagital crest,	22
Length of upper molar series,	25
" lower " "	25½

PALÆOTHERIUM. *Cuvier.*

PALÆOTHERIUM (?) PROUTII. *Owen*, *Norwood*, and *Evans*.*

(Tab. ix., figs. 3, 3 a; Tab. xii. B, figs. 3, 4, 6, 7, 8.)

In the American Journal of Science for 1847, Dr. H. A. Prout has given a description of a fragment of the lower jaw of an enormous Pachyderm, suspected to be a species of Palæotherium. The specimen was the first of the many mammalian remains, which have been brought to the notice of the scientific world from the vast Eocene cemetery of Nebraska.

In Dr. Owen's collection is a fragment of the left side of a lower jaw (Tab. ix., fig. 3 *a*), apparently of the same animal, but of a smaller individual. It is very friable, and originally, i. e., after the death of the animal, was very much compressed and fractured from pressure. The fragment is sixteen inches long, and contains the true molars and portions of the fangs of the two preceding premolars. Along the line of the true molars, the jaw measures nine and a half inches, and below the last molar posteriorly is six inches in depth.

There are also in the same collection the crown of a molar, apparently an inferior third premolar (Tab. xii. B, 7), an inferior canine (8), and a fragment of an upper molar (6), which I suspect belonged to the same individual as the portion of lower jaw.

Besides these the collection contains a left last lower molar (Tab. ix., 3), a right lower penultimate molar, of two other individuals of the same species, and two fragments of upper molars (Tab. xii. B, 3, 4), probably of the latter. The inferior true molars resemble those of Palæotherium in their form, but more particularly those of Anchitherium, in having no trace of a basal ridge internally. The crowns are worn upon the triturating surface into crescentic spaces, from the inner margin of which the sides do not shelve downwards in a convergent manner to the base of the teeth, as in Palæotherium; but the horns of the crescents enclose broad concavities, bounded internally by a thick, obtuse ridge, descending from the elevated ends of the crescents. The basal ridge externally is well developed, and is less deep at the intervals than at the middle of the lobes.

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* Proc. Acad. Nat. Sci., v. 66.

The third lobe of the last lower molar (Tab. ix., fig. 3) has a thick, acute ridge, bounding the cavity upon the inner side of the triturating surface.

The molars undergo a rapid reduction in size anteriorly, for the last molar measures a little over four inches antero-posteriorly, the first true molar twenty-two lines, and the third premolar only seventeen lines.

The latter tooth (Tab. xii., B, 7), presents the same form as the true molars.

The crown of the inferior canine (Tab. xii. B, 8) is curved conoidal, nineteen lines long, and one inch broad at the base. It presents a strongly developed basal ridge internally, which has a feeble disposition to continue externally. The tip of the crown and its antero-external side for half an inch in the specimen have the enamel worn off.

The fragment of an upper molar (Tab. xii., B, 6), considered to belong to the same individual as the portion of lower jaw, consists of a conical protuberance of the inner side of the grinding surface. The remaining fragments of upper molars are single outer lobes. These are deeply concave externally, as in Palæotherium magnum, and have a narrow basal ridge. (Tab. xii., B, 3, 4.)

All the preceding specimens, except, probably, the latter two, I suspect belong to a different genus from either Palæotherium or Anchitherium, and should the suspicion prove correct, Titanotherium would be a good name for the animal, as expressive of its very great size.

RHINOCEROS.

Two species of Rhinoceros are indicated as having existed in the ancient fauna of Nebraska, by its fossil remains. One was about three-fifths the size of the existing Rhinoceros Indicus, and the other was very small, not being a great deal larger than the common Hog.

Both species have been characterized in the Proceedings of the Academy of Natural Sciences, the former under the name of Rhinoceros occidentalis, the latter with that of R. Nebrascensis.

RHINOCEROS OCCIDENTALIS. *Leidy.*

(Tab. ix., figs. 1, 2.)

Rhinoceros occidentalis: Proc. Acad. Nat. Sci., vol. v., p. 119; ib., 276.
Aceratherium occidentale: ib., p. 331.

The species was at first established upon several fragments of teeth, and afterwards confirmed by obtaining several entire teeth.

In the collection of Dr. Owen are contained of R. occidentalis the following specimens:

1. A mutilated skull, with one series of molar teeth entire.
2. Two fragments of lower jaws of different individuals.
3. The distal extremity of an os femoris.

Description of the Skull.—The specimen of the skull is very much fractured, but those parts which are remaining still retain their original position. It has lost almost the entire superficies of the right side, the end of the nose, occiput, excepting its lower portion, and the outer portions of the molar teeth of the right side. It belonged to an adult but not old animal, as the permanent teeth are all protruded, but none of the characteristic grinding surfaces are effaced.

Lateral view.—The side view of the skull presents its most remarkable feature in a striking manner, which is its great degree of straightness antero-posteriorly, when compared with other species. It has the appearance as if a head of the ordinary form of the recent Rhinoceros had been bent downwards anteriorly and posteriorly until it had become nearly horizontal. With a depressed condition of the back part of the skull, a relatively large portion of the temporal fossa is situated posterior to the root of the zygoma.

The upper surface of the latter inclines forwards at an angle only of 15°, and the zygoma itself is rather more sigmoid in its course forwards than in Rhinoceros Indicus, and its outer surface is deep, being nearly two inches, and is moderately convex and nearly vertical.

The temporal fossa has about the same relative extent as in R. Indicus, but is longer and has less vertical depth. Superiorly it is defined by a prominent margin commencing at the post-orbitar process, and coming in contact with that of the opposite side at the posterior part of its course, forming a double parietal crest. The surface of the fossa is very oblique, but for two and a half inches above the root of the zygoma, is convex and nearly vertical.

The orbit is more transversely and deeply excavated, and its orifice is better defined than in R. Indicus.

The supra-orbitar process is large, prominent, convex, and rough, and partially overhangs the inferior margin of the orbit.

The face is relatively longer than in R. Indicus, and therefore very much more so than in Acerotherium incisivum.

From a fragment of the left intermaxillary bone remaining in the specimen, it may be determined to be large and strong, but the notch of the anterior nares is relatively small.

The maxillo-intermaxillary suture is strongly serrate, and reaches within a half inch of the naso-maxillary suture.

Superior view.—The upper surface of the head is remarkable on account of its great breadth at the forehead, and its narrowness posteriorly. It is a slightly depressed plane, prominent at the posterior extremity, as constituted by the double parietal crest, but is most elevated above the forepart of the orbits.

The upper surfaces of the nasal bones incline towards each other in the specimen, probably more than natural, for they are fractured from their connexions, although there appears to be but little displacement.

There is no roughness or elevation upon the forehead, or rise forwards upon the nose, as far as the position of the second molar tooth, indicating the possession of a horn by the animal, and it therefore probably belongs to the subgenus Acerotherium, *Kaup*, although the face, instead of being decreased in length, as in the latter in its relation with the true Rhinoceros, is even increased, as before stated.

Posterior view.—The back part of the head is too much broken to gain much information in the details of its character. It appears to have been relatively narrow, but very much bulging posteriorly, so that the portion forming the upper boundary of the foramen magnum overhangs the latter considerably posterior to its inferior margin.

Inferior view.—(Tab. ix., fig. 1.) In the specimen the right condyle of the occiput and the lower internal portion of the left are broken away, but in the remainder of the latter it is very perceptible that the condyles have a much more vertical position than in R. Indicus.

The basilar process is narrow, the distance between the anterior condyloid foramina being only one inch.

The foramen ovale is distinct from the foramen lacerum, and is placed on a line just in advance of the post-glenoid tubercle.

The latter is relatively short and broad in comparison with that of R. Indicus.

The glenoidal surface is relatively greater antero-posteriorly in comparison with its breadth than in the species last mentioned. It also presents a little more outward, and at its most external posterior portion is more depressed.

The hard palate in the specimen is considerably fractured, but all the parts appear to have remained perfectly in position. It is very narrow and very much arched, especially anteriorly. The teeth in a nearly straight line upon each side converge anteriorly, being distant between the anterior lobes of the last molars twenty-two lines, and between the first of the series only nine lines.

Inferior maxilla.—Of the two fragments of the lower jaw in the collection of Dr. Owen, one broken into two of the left side, contains the posterior two molars, and part of the one preceding, the other fragment, also, of the left side contains the third to the fifth tooth inclusive. Both belonged to adult individuals, but the only anatomical characters to be gained from the fragments, exclusive of the teeth, are the depth of the lower jaw, which is twenty-eight lines below the last molar, and the thickness, which is fourteen lines.

Dentition.—The superior molars (Tab. ix., fig. 1) are about one-third smaller than those of Acerotherium incisivum, and also bear considerable resemblance to them in their form.

They all possess a basal cingulum, which is, however, but feebly developed on the outer side of the anterior half of the fifth and sixth molars, and is obsolete on part of the internal lobes of the same teeth. Upon the premolars, from the second to the fourth inclusive, the basal ridge is very strongly developed.

The posterior molar, as in Acerotherium incisivum, exhibits no tendency to form a posterior valley. Its principal valley is intruded upon only by a slight bulge at the middle of the antero-internal lobe.

In the corresponding lobe to the latter in the preceding two molars, the bulging posteriorly successively increases, and also exists anteriorly. This dilatation of the antero-internal lobes decreases the depth externally of the anterior valleys, so that they slope downwards from their entrance, and in the trituration of the teeth they are obliterated from without inwards, leaving no islets of enamel behind as in the premolars.

In the specimen under consideration, the abrasion of the first true molar has effaced the outer half of the anterior valley.

In the second to the fourth premolars inclusive, the inner lobes are confluent internally at their bases, but to a less extent in the anterior than the remaining two of those designated. From trituration, the latter in the specimen exhibit the remains of the anterior valleys as simple trilateral pits of enamel occupying the centre of a broad space of dentine, while in the former the anterior valley still continues open internally. The posterior valleys of the posterior three premolars are as deep externally as the corresponding portion of the anterior valleys. The basal ridge of the three teeth just designated, envelopes the base of the postero-internal lobes to a much greater extent than upon the preceding lobes, and in the specimen under observation the first premolar presents an almost equilateral triangular triturating surface, possessing both internal lobes in a rudimentary state. Constituent portions of the basal ridge connect the bases of the lobes together. The short anterior valley remains open internally, but the external extremity only of the posterior exists as a small trilateral pit of enamel.

Inferior molars.—(Tab. ix., fig. 2.) The teeth preserved in the fragments of lower jaws referred to belong all to the posterior four molars, and these do not differ in their form from those corresponding to them in recent species of Rhinoceros.

A basal ridge exists in all, but is obsolete on the inner side of the posterior three molars and the outside of the hinder lobe of the same teeth, except the last.

ADMEASUREMENTS.

	Inches.
Length from occipital condyle to first premolar, ...	14¾
Distance from end of post-glenoid tubercle to parietal crest, . . .	6
Height of face from alveolar border to supra-orbitar prominence, . .	5½
Distance from occipital condyle to anterior margin of orbit, . .	10¾
Breadth of skull at zygoma, ...	8¾
" of forehead at supra-orbitar protuberances, . . .	7
Length of upper molar series, ...	7¼

RHINOCEROS NEBRASCENSIS. *Leidy.*

(Tab. xii. A, fig. 6; Tab. xii. B, fig. 5.)

Rhinoceros Nebrascensis: Proc. Acad. Nat. Sci., vol. v., p. 121.
Acerotherium Nebrascense: ib., p. 331.

This species was first established upon the anterior portion of a skull and lower jaw, containing all the molar teeth of an old individual belonging to the collection of the Smithsonian Institution.

In Dr. Owen's collection is a head of the same species, of a very old individual, with the upper part the whole length broken away. It contains all the molars nearly perfect, which, however, have the crowns worn nearly to the edge of the alveoli.

There is also in the same collection a face, very much mutilated, except the forehead, of an individual which had just reached adult age. It contains all the molars nearly perfect; the last one about two-thirds protruded.

Besides the foregoing, there are several small fragments of upper and lower jaws, as follows:

1. A portion of an upper jaw, containing the first permanent true molar, slightly worn, and a fragment of the fourth permanent premolar still concealed within the jaw.
2. A posterior fragment of a lower jaw containing the last three molars.
3. A fragment of a lower jaw of a very young animal, containing the posterior temporary molar, and the first permanent true molar, both unworn.

Description of the head.—In the lateral view, Rhinoceros Nebrascensis presents most of the peculiarities of Rhinoceros occidentalis.

The root of the zygoma is implanted at the lower part of the middle of the temporal fossa. The surface of the latter is convex, and relatively smooth.

The orbit has nearly the same form as in Rhinoceros occidentalis, but its floor is more superficial. Its entrance is well defined, as in the latter species, but the supraorbitar process is not quite so prominent nor so rough. The post-orbital process is distinct. At the inner canthus is a short lachrymal process, and internal to this two lachrymal foramina, one above the other.

The face, as constituted by the alveoli for the superior molars, is vertical; above this it appears to have been oblique, but it is too much broken in the specimens to judge accurately of its form.

The infra-orbital foramen is placed about an inch above the interval of the second and third premolar.

The malar bone is directed rather more outwardly than in Rhinoceros occidentalis, and its external face presents more upwards.

The forehead is broad, elevated, and convex above the orbits, but depressed and concave in the middle. The ridges upon the frontal bone which define the temporal fossa antero-superiorly, curve rapidly inwards from the post-orbital processes, and in the specimen in which the forehead is preserved, an inch behind their commencement, they are within five lines of each other, so that they no doubt joined to form a parietal crest, the superior boundary of the temporal fossæ.

The occipital surface is much more trilateral than in Rhinoceros Indicus, and is relatively narrow, but bulges in the middle so that its extent of surface is really not reduced.

The foramen magnum occipitis is subrotund, about ten lines in diameter. Its margin above is notched, and overhangs considerably posterior to the inferior margin, so that the foramen is directed more downwards than in R. Indicus. The occipital condyles are more vertical than in the latter.

The mastoid process forms the posterior boundary of an inverted U-shaped passage to the tympanum, and projects inferiorly nearly as much as the post-glenoid tubercle. The latter relatively to that of Rhinoceros Indicus, is very short, being only ten lines. It is, however, broad and robust and truncated at its extremity. The glenoid surface upon the root of the zygoma is directed rather more outwards and backwards than in R. Indicus, but upon the post-glenoid tubercle is depressed and directed forward with a slight inclination outwards.

The post-glenoid tubercle is relatively to that of Rhinoceros Indicus very short, but is broad and robust, and truncated at its extremity.

Inferior maxilla.—The body of the lower jaw is vertically convex, and its base more convex antero-posteriorly than in Acerotherium incisivum. The ramus is much depressed internally, and is thin. The posterior maxillary foramen is situated about an inch posterior to the last tooth.

Dentition.—The permanent teeth remain until a late period of life without any reduction of their number, except the normal first of the lower jaw, as illustrated in the skull containing on both sides all the molars, seven in number, worn down nearly to the edge of the alveoli. The formula for the molars is $\frac{7}{6}$.

The upper teeth (Tab. xii. A, fig. 6), bear very great resemblance to those of Acerotherium incisivum. They all possess a basal cingulum, well developed all round, when not obliterated by pressure where the teeth are in contact with one another, except at the inner side of the bases of the internal lobes of the posterior three molars.

The last molar exhibits a tendency to the formation of a posterior valley by the presence of a deep vertical depression at its posterior angle. The bottom of the principal valley is nearly level, and nearly as deep as the crown; and at its entrance is bounded by a mammillary eminence, a constituent portion of the basal ridge. The internal lobes are simple; the anterior is slightly expanded at its middle posteriorly.

The preceding two molars have their inner lobes directed in a slightly sigmoid course, inwards and backwards. These lobes are simple, expanded at base and internally, and rapidly taper towards their summit. The anterior lobes are dilated at their middle posteriorly, increasing in this disposition successively from the last to the fifth molar. The anterior valley of the fifth and sixth molars is broad, and decreases in depth from the entrance outwards, so that in the attrition to which these teeth are subjected, the anterior valleys commence to be obliterated from their termination.

In the second to the fourth molars inclusive, the anterior of the inner lobes is the larger, and all the latter become dilated just before their termination, and confluent from their bases, most so in the third molar, and least in the fourth. The anterior and posterior valleys are nearly of the same depth at their termination externally, except in the fourth premolar, in which the posterior valley is more shallow. The basal ridge of these teeth is well developed all round, envelopes the base of the postero-internal lobe to twice the extent it does that in advance, and from its great vertical extent posteriorly adds very much to the depth of the posterior valley.

The first molar still retains the two internal lobes, of which the posterior is very distinct, but the anterior is reduced to the condition of a tubercle rising out of the basal ridge, and connected by a transverse lamina with the internal side of the outer portion of the tooth.

The inferior molars (Tab. xii. B, 5; xv. 3), six in number on each side, closely resemble those of Acerotherium incisivum. They possess a basal cingulum developed all round. The first of the series in the outline of a transverse section forms an isosceles triangle, but like all the others, it is constituted of two lobes, of which the anterior is so compressed laterally as almost wholly to lose its crescentic appearance.

ADMEASUREMENTS.

	Inches.	Lines.
Length from occipital condyle to anterior part of first molar, .	9	2
Greatest breadth at zygomæ, ...	5	9
Breadth at infra-orbitar foramina, ...	2	3
" just above root of zygomæ, ...	2	8
Length of molar series, ...	4	6
Antero-posterior diameter of the sixth upper molar, . .		11
Transverse " " " " " . .		11
Antero-posterior diameter of the fifth lower molar, . . .		10½
Transverse " " " " " . . .		6

ARCHÆOTHERIUM. *Leidy.*

(Tab. x., figs. 1, 2, 3; Tab. xi., fig. 1.)

Archæotherium Mortoni, *Leidy:* Pr. Ac. N. S., vol. v., p. 92.

This remarkable Pachyderm, judging from the form of its teeth, is closely allied to the Chœropotamus, *Cuvier*, and the Hyracotherium, *R. Owen.*

The species was first indicated by a fragment of the face containing the posterior two premolars of the left side. In Dr. Owen's collection is a more characteristic specimen, consisting of the middle portion of the face, much mutilated, of A. Mortoni. This fossil contains the first and second true molars on both sides entire, excepting the former of the right side, which has a portion broken off. It also possesses the alveoli still retaining the fangs of the last molars, and also those for the last premolars, and a portion of those in advance.

The crowns of the first and second true molars (Tab. xi., fig. 1) differ most strikingly from those of the corresponding teeth of Hyracotherium, in not possessing a continuous ridge around the base, and from those of Chœropotamus in the total absence of a basal ridge on the inner side.

The crowns of the teeth just alluded to of Archæotherium, are quadrilateral, nearly cuboidal. The triturating surfaces anteriorly project into a remarkably prominent basal ridge or platform one line thick, and three lines deep below the commencement of the enamel. Posterior to this ridge the crown is elevated into six mammillary eminences placed in two transverse rows a little convex forwards from the middle, and smaller ones being placed in a trifling degree in advance of the others. The postero-internal cone is continuous from its apex with an oblique prominent ridge descending to the base of the postero-external cone posteriorly. On the outside of the crown is a slight oblique ridge connecting the bases of the external cones. The apices of all the latter, which are unworn, exhibit an excavation relatively slight to that of Hyracotherium.

The enamel where the original surface is preserved is thick and rugose. Upon the second molar it is slightly worn, but upon the triturating surface of the first has in greater part become very thin, and at the summits of the cones, excepting the postero-external and internal, is completely removed, so as to present lenticular-shaped surfaces of dentine.

The crown of the posterior molar, judging from the base of connexion with the fangs still remaining, was also quadrilateral, but the outside inclined backward and inward as in Rhinoceros, and the posterior side was relatively small.

The fragment alluded to containing two premolars, belonged to an older individual than the preceding, and consequently the teeth are more worn.

The last premolar has a quadrilateral crown, the inner side being the shortest, and is convex. Posteriorly it possesses a prominent basal platform continuous with a very slight ridge postero-externally. Antero-externally there is also a slight ridge, which was probably continued anteriorly, but is worn away. The triturating surface is worn off to a transversely ellipsoidal disk of dentine, margined by enamel, and continuous, by a short isthmus on the anterior side of the tooth, with a second and smaller transversely ellipsoidal surface just over the antero-external fang.

The premolar in advance is compressed, conoidal, convex externally and internally, and presents a slight basal ridge antero-internally and postero-externally. The apex of the crown is worn off, leaving a subcircular dentinal surface, continuous with an exposed tract the whole length of the posterior side.

The true molars and the contiguous premolars are implanted by three fangs, two external and nearly vertical, and a third internal, broad, and apparently composed of two which are confluent.

The penultimate premolar is implanted by two fangs, also nearly vertical.

The face in the specimen containing the true molars is very much fractured, but in conjunction with the second fragment, a few characters may be obtained which are important.

The face is elongated, as in the Hog, but is not compressed laterally, as in Hyracotherium, but is demi-cylindroid, narrowing anteriorly.

The nasal bones extend as far back as to be on a line with the anterior margin of the orbit. They very gradually increase in breadth for two inches from behind, and then again gradually decrease. They form a continuous convexity with the maxillary bones. The frontal projects between the latter and the former, on a line with the posterior surface of the last premolar. The malar and lachrymal bones advance upon the face to about half an inch of the same line.

The hard palate is strongly arched from side to side.

ADMEASUREMENTS.

	Inches.
Estimated length of line of posterior five molars, ...	4¼
Distance between the second true molars, ...	1⅞
Height of face on a line with the last premolar, ...	3
Height on a line with the second true molar, ...	4
Breadth of face above the second true molar, ...	3¾

The species was dedicated to the late Dr. Samuel George Morton, formerly President of the Academy of Natural Sciences of Philadelphia, and author of Crania Americana, Crania Egyptiaca, etc.

Since writing the preceding description of the specimens upon which were established the Archæotherium Mortoni, I have had an opportunity of examining another and very important fragment of the same animal, which until now had not arrived from Dr. Owen's residence in Indiana. It belongs to the same collection of Nebraska fossils which form the basis of this part of Dr. Owen's Report. The specimen consists of the greater portion of the cranium proper, the right side of which is nearly entire, part of the forehead and face without the nasal bones and anterior extremity, and portions of both sides of the lower jaw (Tab. x., 1–3). It belonged to a young animal, as the sutures generally are separable, and the temporary teeth had not yet been shed.

In the upper jaw (Tab. x., fig. 1) of the specimen upon the right side are preserved in place the second and third temporary molars, and the three permanent true molars, the last of which still remained concealed within the jaw. On the other side the posterior permanent premolars have been exposed, and the anterior two permanent molars are in place. In the fragment of the right side of the lower jaw (Tab. x., fig. 2) a portion of the last temporary molar and the first permanent molar are preserved, and a part of the last permanent premolar is observed within the jaw at its anterior broken extremity. The other fragment (Tab. x., fig. 3) very much crushed, contains the three permanent true molars, the last of which had not yet protruded, a portion of the last temporary molar, and the last permanent premolar, which is partially exposed at the broken end of the specimen.

The skull (Tab. x., fig. 2) is quite peculiar in its form from that of any existing animal, and among known extinct species was probably most like that of Chœropotamus, to which Archæotherium is very closely allied. The cranium proper, in the great extent and general form of the temporal fossæ, separated by a high sagittal suture, resembles the cat tribe, and more particularly the extinct genus Machairodus; while the vertical orbits are separated from the temporal fossæ by post-orbital arches, relatively as strong as in the Ruminants. The face posterior to the penultimate premolar is demi-cylindrical, and constructed very much like the corresponding portion of the head of Chœropsis. The specimen indicates an animal a little larger than the Chœropotamus parisiensis, *Cuv.*

Lateral view.—(Tab. x. 2.)—The temporal fossa has about the same length as the depth, and extends antero-posteriorly from the lateral margin of the inion to the posterior margin of the orbit, and in this direction measures in a straight line about the middle five inches. The breadth is relatively as great as in Felis or Machairodus, measuring from the upper edge of the zygomatic process two inches seven lines. The temporal surface from above downwards is convex, and about a third of its extent is contributed by the frontal bone. The squamous portion of the temporal bone is relatively small, appearing as if it was extended outwards to form the broad deep root of the zygomatic process, which, as in Sus and Dicotyles, originates on a line with the lateral border of the inion.

The squamous suture descends in an irregular convex line in an unusually abrupt manner, and the coronal suture after passing obliquely backwards and downwards upon the temporal surface for a little over an inch, then descends vertically an inch and a half posterior to the anterior margin of the temporal fossa.

The parietal bone has a remarkably broad descending process to join the sphenoid.

The outer margin of the zygoma posteriorly is broken in the specimen. The portion of the process which turns forward to join the malar bone, is about three-fourths of an inch deep, and curves upward.

The glenoid cavity appears to hold the same relative position as in the Peccary, but this, as well as the entire base of the cranium, is still enveloped in a hard matrix.

The meatus auditorius externus and its process, also obscured by matrix, appears to hold a position at the bottom of a deep fossa posterior to the glenoid articulation.

The orbital entrance is vertically oval, and is directed outwards and as much forwards as in the Cats, but not at all upwards. It is broader below than above, and its supra orbital margin is prominent outwards. Internally or anteriorly its margin presents a mammillary lachrymal process, above and below which it is notched.

The malar bone advances upon the face as far forward as the lower part of the anterior border of the lachrymal bone. Its inferior margin ascends anteriorly, and below the orbit its external face is bent upwards, and is remarkably shallow, being at the narrowest part just in advance of the middle of the orbit only half an inch, and behind the orbit it is as remarkably deep, measuring from the summit of the post-orbitar process vertically two and one-third inches.

The face is long, broad, and demicylindroid in form, though it appears comparatively narrow, with the great breadth of the cranium from zygoma to zygoma. The sides of the face are vertically convex, and the exit of the infra-orbitar canal is a large oval foramen, advancing upon a correspondingly large depressed portion of the upper maxilla, situated three-quarters of an inch above the crown of the second temporary molar, and two and three-quarter inches in advance of the orbit.

The facial portion of the lachrymal bone is an oblong, quadrilateral plate, inclining forwards and upwards, and measures nearly two inches antero-posteriorly.

Upper view.—The cranium proper viewed from above has a very striking resemblance to that of the Cats. The brain-cavity is much shorter, and is relatively narrower, and more uniform in its breadth. The summit of the sagittal crest and of the protuberance of the apex of the inion are broken in the specimen, but sufficient remains to obtain a good idea of the form of both.

The apex of the occiput appears to have been quite as prominent as in the Tiger, though not so concave laterally, and posteriorly it appears to have been notched as in the Peccary. From it passes forward a high pyramidal sagittal crest, which has been about three inches in length to its bifurcation, which takes place just before reaching the coronal suture. The two branches proceeding from the crest are remarkably prominent and thick at their commencement, but gradually decrease in these respects, and diverge upon the frontal bone to the post-orbital arches.

The forehead in advance of the bifurcation of the sagittal crest, and along its middle line, is deeply depressed and uneven. From one orbit to the other exclusive of its middle depressed portion it is convex. Anteriorly, in the specimens, the connexions of the frontal bone are broken away, but the other specimens described indicate the existence of angular processes, proceeding forward between the broad lachrymal plate and the nasal bones to join the upper maxillary, as in Chœropsis.

Inferior maxilla.—Both fragments of the lower jaw are too much crushed to gain many characters of importance from them. That of the right side, which is best preserved, is not quite two inches in depth below the first permanent true molar. Below the position anteriorly of the unprotruded last permanent premolar, a process projects from the base outwards and downwards, like in Anthracotherium.

Dentition.—The superior anterior two permanent molars have been already described, and it is therefore unnecessary to say anything more about them in the specimen under examination, except that they are in a trifling degree longer, and the second is a little more convex at its sides; variations probably of a sexual character, but not improbably also only individual.

The last upper true molar is smaller than those in advance, and is more convex at its sides. The basal ridge anteriorly, and first row of mammillary eminences are as well developed as in the preceding molars, but the posterior row has dwindled down in connexion with the corresponding portion of basal ridge into about four low tubercles.

The superior two premolars described in one of the specimens, were so much worn that another description of the two preserved in the present one (Tab. x., fig. 1), which had not yet protruded, will be important.

The crown of the last premolar is constituted by two large conoidal lobes, of which the internal is about one-third smaller than that situated external. At the base of the lobes, anteriorly and posteriorly, there exists a basal ridge; better developed and tuberculate in the latter position.

The crown of the penultimate premolar is a transversely compressed cone, having developed at its base antero-internally, and in a less degree postero-internally, a basal ridge.

The upper temporary true molar is quadrilateral, with the inner three sides combined into one convexity, and is longer than it is broad. It is constructed after the type of the permanent true molars, but the anterior basal ridge and the inner mammillary eminences are relatively not so well developed.

The penultimate premolar presents the characteristic elongated form of the temporary tooth of the series in most Ungulata. It looks as if formed by a prolongation of the anterior lobes of a tooth like the last temporary molar, and the association of its anterior mammillary eminences into a single one. The inferior permanent true molars present a striking resemblance of form to those of the Peccary, with which Archæotherium is a near relative. They present in outline the figure-of-8 form, and all present two transverse pairs of mammillary eminences, with a feebly developed basal ridge anteriorly, and a thicker and tuberculated ridge posteriorly. The latter of the last molar is not better developed than in those in advance. A peculiarity of these teeth of Archæotherium is the division at summit of the antero-internal lobe into two. The fragment of the last inferior temporary molar preserved in the specimen, is constructed on the same pattern as those just described, and, as in most Ungulates, had six lobes to the crown arranged in three transverse rows.

The last permanent premolar, which had not yet protruded, and is partially exposed only in the specimen, appears to have the same form as the penultimate premolar above.

From none of the permanent molars being worn to any extent in the specimen, the enamel presents a remarkably wrinkled appearance, particularly upon the sides of the eminences of the true molars.

ADMEASUREMENTS.

	Inches.
Estimated length from the summit of the inion to the commencement of the nasal bones, ...	7¼
Length from occipital condyle to the lachrymal process, . . .	7
Breadth of skull at zygomæ, ...	8
" " cranium at middle of temporal surface, ...	2½
" at suture crossing the post-orbital arch, ...	6½
" of face at the anterior true molar alveoli, ...	3¼

EUCROTAPHUS. *Leidy.*

EUCROTAPHUS AURITUS. *Leidy.*

(Tab. xv., figs. 1, 2.)

The genus Eucrotaphus was proposed in the Proceedings of the Academy, vol. v., page 92, upon a posterior portion of a cranium, remarkable for the large relative size of the pars squamosa of its temporal bones. Since the description of the specimen the corresponding portion of the head of Oreodon has become known, between which there is a great degree of resemblance. In both genera the pars squamosa is very large, the temporal fossæ unite at the top of the cranium upon a sagittal crest, and the parietal bones, which are very narrow between the tops of the temporal bones, are also very much advanced in their position. In both, also, the glenoid articulation is nearly transverse, but in Eucrotaphus the post-glenoid tubercle is very much thicker. In this, also, the os tympanica forms a large auditory bulla, while it is reduced to little more than a prominent crest in Oreodon.

In Dr. Owen's collection is a corresponding portion of a cranium (Tab. xv., 1, 2) to that described of Eucrotaphus Jacksoni, but it is rather larger, and probably indicates a distinct species. In it the auditory bullæ are not simply mammillary, as in E. Jacksoni, but are laterally compressed ovoidal. For this second species the name Eucrotaphus auritus is proposed.

Nothing is certainly known of the dentition, or of the anatomical characters of the face of Eucrotaphus.

I suspect from the relation of size of the described fragments of the latter to the jaws of Agriochœrus,* and the general resemblance of the true molars of this to those of Oreodon, that the former two are really one and the same genus; but to determine this with certainty it must be left for further discovery.

MACHAIRODUS. *Kaup.*

MACHAIRODUS PRIMÆVUS. *Leidy* and *Owen.*†

(Tab. xii. A, fig. 5.)

Of this species Dr. Owen's collection contains a much fractured head, with the symphysis of the lower jaw, zygomata, and ends of the nasal bones broken away. Portions only of both superior canines, much fractured, remain in the specimen. The superior incisors were lost originally, and the alveoli are filled by matrix.

The cranium is one-fourth less in size than that of the Panther, Felis concolor, or about half that of Machairodus neogæus.

Lateral view.—(Tab. xii. A, fig. 5.) The temporal fossæ are relatively shorter and vertically deeper than in the Panther, and have a very much greater extent of surface anterior to a line drawn vertically from the glenoid cavity, and very much less posteriorly. A very large surface for attachment of the temporal muscle is also formed upon the post-orbital process, and the whole disposition of the temporal surface is to give a more vertical direction of the fibres of the temporal muscle in their course to the coronoid process than exists in the Panther and other species of Felis.

The para-mastoid and mastoid processes are combined into an oblique process an inch in its length and absolutely very much more robust and stronger than in species of Felis of larger size.

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* Proc. Acad. Nat. Sci., vol. v., 121.

† Ib. p. 329.

The passage to the meatus auditorius externus between the post-glenoid tubercle and the mastoid process is relatively very much narrower than in the Panther.

The face is more uniform in breadth along the course of the nose than in the Panther, and is convex and not depressed as in the latter, above the infra-orbitar foramina.

The forehead is elevated one inch above the extremity of the post-orbitar processes, is transversely very convex, depressed along the median line, and presents very obliquely forward.

The malar bones are relatively narrow; the face below their anterior extremity relatively broad.

The infra-orbitar foramina are twice the size of those of the Panther. The orbits present in about the same direction as in the latter. The squamous, coronal, interparietal, and interfrontal sutures are obliterated. The fronto-maxillary and naso-frontal sutures are strongly serrated.

The intermaxillary bone reaches to within a half inch of the frontal.

In the lower jaw a striking character is the relatively short coronoid process which is also vertical, or not at all curved backward. The post-coronoid process bends outward instead of inward, as in the species of Felis. About three inches from the condyle, near the base, and proceeding to it, is a ridge, apparently the commencement of the inferior margin of the remarkable alar process of the chin of Machairodus.

Dentition.—The superior canines, judging from their much mutilated stumps, have been very long, compressed in form, but relatively narrow antero-posteriorly to those of Machairodus neogæus. At their alveoli they measure seven lines antero-posteriorly, and four lines transversely. The concave border of one of the teeth in the fossil, nine lines below the base of the enamel, commences to be trenchant, and delicately serrulated. Also, antero-internally, the oblique serrulated ridge begins at the base of the crown, and is directed anteriorly.

The superior incisive alveoli remain in the specimen: they are of very large size, and increase from the first at the median line to the last, and leave no interval or hiatus between the latter and the superior canine for the reception of the lower canine.

The hiatus between the superior canine and the second molar, the first having been shed, as if depending upon the diminished breadth of the former, compared to its condition in Machairodus neogæus, is unusually large, being seven lines.

The second molar relative to that of the Panther, is small; it is also short in relation to its breadth. It has three distinct lobes: an anterior, oblong talon, a posterior, simple, compressed, trenchant lobe, separated by a notch from a middle, compressed, conoidal cusp.

The superior carnassial tooth presents the same form as in Machairodus neogæus, and is particularly distinguishable from that of the true Cats by its middle lobe being broad and trenchant instead of pointed.

In the lower jaw, as before mentioned, the chin is broken away, but upon one side, nine lines of hiatus remains anterior to the first molar, below which the surface is depressed for the better accommodation of the superior canine.

The first molar has three lobes: an anterior and a posterior rounded talon, and a middle, compressed conoidal cusp. The former are nearly equal in size and the latter is a little larger.

The second molar is relatively longer than that of Felis. It also has three lobes, the anterior of which is relatively broader than that of M. neogæus, and is nearly equal to the posterior, which is notched at summit. The middle lobe is long conoidal compressed.

The inferior carnassial tooth is relatively broader than that of M. neogæus, and is more complex in its form from the presence of an additional lobe to that already existing in excess in this species, beyond what it is in Felis.

ADMEASUREMENTS.

	Inches.	Lines.
Length from occipital condyle to superior incisive alveoli, .	6¼	
Breadth above the superior carnassial tooth, . . .	3	
" at canine alveoli, ...	2	
Antero-posterior diameter of superior carnassial tooth, . . .		10

DESCRIPTIONS OF CHELONIA.

TESTUDO. *Linnæus.*

In Dr. Owen's collection of fossil remains from Nebraska, there are four species of Turtles, belonging to the genus Testudo.

The carapace of the latter is composed ordinarily of ten vertebral plates, eight pairs of costal plates, and eleven marginal plates each side of the nuchal and pygal plate.

The first vertebral plate is quadrilateral, with convex sides, and long and narrow.

The succeeding plates to the penultimate are most frequently hexahedral.

The penultimate plate is inverted V-shaped, and the last is rhomboidal, and received between the preceding and the pygal plate. The costal plates are alternately broad and narrow.

The carapace is also invested by five vertebral scutes, four pairs of costal scutes, and eleven marginal scutes, each side of a narrow nuchal, and a broad undivided pygal scute.

The sternum is composed of an entosternal plate, and four pairs of lateral plates, invested by eight pairs of lateral scutes, including those supplementary to the axillary and inguinal notches.

All the specimens of fossil Turtles above referred to, belonged to immature individuals, as the costal plates were still united by cartilage to the marginal plates when the animal died.

TESTUDO NEBRASCENSIS. *Leidy.*

(Tab. xii. A, figs. 1, 2.)

Stylemys Nebrascensis: Pr. Ac. Nat. Sci., vol. v. 172.
Testudo Nebrascensis: ib., vol. vi., 59.

This species was first characterized as belonging to a new genus, under the supposition that the processes which rise upwards from the sternum to aid in the support of the carapace were distinct bones, a mistake which arose from their unusual size and prominence, and their being detached by fracture from the sternum.

In Dr. Owen's collection, there are two specimens of this species, varying in size, and in some degree in minute anatomical detail. Both have the marginal plates broken away in front and behind, and the larger has lost nearly all its carapace, and the smaller the anterior portion of the sternum. The carapace of the smaller specimen has a vertebral plate in excess introduced between the eighth and the V-shaped plate.

The species is more depressed than the Gophir, and has more the form of the Emydes than the Testudines. The sternum is flat, and the axillary and inguinal notches are directed downwards.

The marginal plates are quite oblique above, and turn abruptly under at their lower third. The bones are relatively thick and strong.

In the smaller specimen the first vertebral plate is ten lines long and six broad. Those from the second to the eighth inclusive are hexahedral; the anterior four being the larger and nearly equal in size. The ninth or accessory plate is transversely oblong, quadrilateral.

Each vertebral plate after the first to the eighth inclusive, articulates with two pairs of costal plates.

The first costal plate externally articulates with the first to the third marginal plates, but does not quite reach the fourth. The vertebral scutes from the second to the fourth inclusive, are hexahedral, and broader than long.

The sternum agrees in its characters in both specimens, except in the smaller, the anterior border of the humeral scute courses along the posterior edge of the axilla, whereas, in the larger, at its external part, it turns forwards and outwards to the axilla.

The entosternal plate is pyriform, and is longer than it is broad, and encroaches upon the position of the gular scutes.

In the larger specimen the episternals are one and a half inches long. The hyosternals are two and a quarter inches long, and articulate with the third to the fifth marginal plate inclusive.

The hyposternals articulate with the fifth to the seventh marginal plates.

The gular scutes are angular posteriorly. The humeral scutes internally are six lines long, and externally expand before and behind, and join the axillary and the fourth and fifth marginal scutes.

The abdominal scute, in the smaller specimen, joins the sixth and seventh marginal and the inguinal scutes, and in the larger specimen, the latter and the sixth and fifth marginal scutes.

ADMEASUREMENTS.—TWO SPECIMENS.

	SMALLER.		LARGER.	
	Inches.	Lines.	Inches.	Lines.
Estimated length of sternum, . . .			7	
Breadth, ...	4	9	5	6
Height, ...	2	11		

TESTUDO OWENI. *Leidy.*

(Tab. xii. A, figs. 3, 4.)

Emys Oweni: Pr. Ac. Nat. Sci., vol. v., 327.
Testudo Oweni: ib., vol. vi., p. 59.

This species is established upon a nearly entire carapace and plastron. The former is more convex than in the Gophir, and posterior to the fifth vertebral plate is more retuse.

The costal plates in the individual were yet united by cartilage to the marginal plates. The latter at the sides are vertically convex; anteriorly and posteriorly less shelving than the dorsum generally; and above the axillary and inguinal notches slightly reflected.

The sternum is flat except at the union with the carapace, where it is convex, and anteriorly is turned upwards.

In the specimen there are ten vertebral plates. The first is one and a half inches long and ten lines broad. Those succeeding to the eighth inclusive are hexahedral and articulate each with two pairs of costal plates.

The tenth vertebral plate is fourteen lines long and seventeen broad.

The nuchal plate comes in contact only at the anterior angle of the first costal scute, and measures three and three-quarter inches in breadth, equal to the first vertebral scute.

The second and third vertebral scutes are nearly equal in size, each being about two inches seven lines broad, and the former two inches long, and the latter one line greater. The lateral margins are parallel and bow-shaped. The fourth vertebral scute is slightly broader than long, and the lateral margins are bow-shaped and convergent posteriorly from their middle.

The entosternal plate is pyriform with the anterior extremity bordering the margin of the gular scutes, and the base extending to the humeral scutes. It is twenty-eight lines in length and breadth.

The hyosternals are three and a half inches long, and articulate with the third to the angle inclusive of the sixth marginal plates.

The hyposternals are two and a half inches long at their middle, and articulate with the sixth and seventh marginal plates.

The gular scutes are convex posteriorly, and do not encroach upon the position of the entosternal plate.

The humeral scutes internally average seven and a half lines long, but externally expand before and behind, and join the axillary scutes and the fourth, fifth, and sixth marginal scutes. The abdominal scutes are three inches long, and join the sixth and seventh marginal and the inguinal scutes.

ADMEASUREMENTS.

	Inches.	Lines.
Length of sternum at middle line, ...	10	
Breadth " at posterior margin of hyosternals, .	7	
Estimated length of antero-posterior curve of the carapace,	13	6
Height, ...	5	6

TESTUDO CULBERTSONII. *Leidy.*

(Tab. xii.)

Emys Culbertsonii: Pr. Acad. Nat. Sci., vol. vi., p. 34.
Testudo Culbertsonii: ib. p. 59.

This species is established upon a nearly entire carapace and plastron, a little crushed out of its original form upon one side. It is much larger than Testudo Oweni, and is relatively less convex and high in comparison to its length and breadth.

The marginal plates laterally are vertically convex.

The sternum is concave, indicating a female individual, and the axillary and inguinal notches are directed downwards.

The carapace in the specimen has eleven vertebral plates.

The first vertebral plate is two and a quarter inches long and one and a half inches broad.

The second vertebral plate is octohedral, with alternately long concave and short straight sides, and articulates laterally with the first, second, and third pairs of costal plates.

The third vertebral plate is quadrilateral, and articulates laterally with only the third pair of costal plates. The arrangement of the two last described vertebral plates is very similar in the recent Gophir.

The other vertebral plates to the eighth inclusive are hexahedral. The ninth vertebral plate is quadrate, and is an accessory to the usual number introduced between the eighth and the penultimate, or inverted V-shaped plate.

The second and third vertebral scutes are broader than long, quadrilateral, with the lateral margins bow-shaped. The fourth vertebral scute is considerably longer than broad, and the fifth is prolonged at its anterior part to join the former.

The entosternal plate is pyriform, and is a little broader than long.

The hyosternal plates are over five inches long, and articulate with the third to the angle inclusive of the sixth marginal plates.

The hyposternals are four inches long, and articulate with the sixth and seventh marginal plates.

The gular scutes are acute behind, and encroach for three-fourths of an inch upon the position of the entosternal plate.

Internally the humeral scutes average eleven and a half lines long, and externally join the axillary and the fourth and fifth marginal scutes.

The abdominal scutes are four and a half inches long, and join the sixth and seventh marginal and the inguinal scutes.

ADMEASUREMENTS.

	Inches.
Estimated length of sternum,	15
Breadth,	11
Height,	6½
Length of antero-posterior curve of the carapace (estimated),	22

TESTUDO HEMISPHERICA. *Leidy.*

(Tab. xii. B, figs. 1, 2.)

Emys hemispherica: Proc. Acad. Nat. Sci., vol. v., 173.
Testudo hemispherica: ib.

This species was first established upon a specimen of a sternum with a small portion of the carapace from the collection of Mr. Culbertson.

In Dr. Owen's collection is a specimen consisting of almost the whole of a carapace and sternum, but much fractured and otherwise mutilated. It is relatively higher or more convex than any of the preceding, and is rather hemioval than hemispherical as the name indicates.

The costal plates were still connected by cartilage to the marginal plates at the time the animal died.

There are ten vertebral plates. The first is quadrilateral and twice as long as broad. Those succeeding to the eighth inclusive are hexahedral. The second to the fifth are nearly equal in size, and the others gradually decrease. The tenth plate is a regular trapezium, enclosed by the ninth or inverted V-shaped plate and the pygal plate, and is divided at its middle by the last vertebral scute.

The first costal plate is thirty-three lines long by eighteen broad, and articulates with the first, second, and three-fourths of the third marginal plates.

The lateral marginal plates are nearly vertical, being bent under only in a relatively slightly convex manner at their lower fourth.

The first vertebral scute comes in contact with the first marginal plate at its postero-internal angle, where it measures two and a half inches broad. The second and third vertebral scutes are of nearly equal size, being two and a half inches wide and twenty-two lines long.

The axillary notches present outwards and downwards; the inguinal notches downwards.

The sternum anteriorly shelves upward, and its margin the breadth of the gular scutes, though not truncated, is very obtuse, and posteriorly it is notched.

The entosternal plate is as broad as it is long, being about two inches, is short pyriform, reaches the border of the humeral scute behind, and encroaches a half inch upon the position of the gular scutes.

The hyosternal plates articulate with the third to the anterior angle inclusive of the sixth marginal plates.

The hyposternals articulate with the sixth and seventh marginal plates.

The humeral scutes internally are half an inch long, and their anterior border externally curves forwards and outwards to the axillæ. They join the axillary and the fourth and fifth marginal scutes.

The abdominal scutes are two and three-quarter inches long, and join the sixth and three-fourths of the seventh marginal and the inguinal scutes.

ADMEASUREMENTS.

	Inches.	Lines.
Length of the sternum at the middle, ...	8	6
Breadth to articulation with the marginal plates, . . .	6	3
Length of antero-posterior curve of the carapace (estimated), .	13	
" transverse curve from a level of the sternum, . .	14	
Height of carapace from level of the sternum, . . .	5	

CONCLUSION.

Besides the various remains of Mammalia and Chelonia described or mentioned in the preceding chapters, a number of others have been obtained from the same locality, of which the following list is a synopsis.

PŒBROTHERIUM WILSONI. *Leidy.*

An extinct species and genus of Ruminants most closely allied to the existing Musks or the extinct Dorcatherium, *Kaup*, of Europe. It was established in the Proceedings of the Academy of Natural Sciences of Philadelphia, vol. iii. p. 322, for 1847, upon the greater portion of a skull containing nearly all the molar teeth, of which those temporary had not yet been shed. The specimen was presented to the Academy by Mr. Joseph Culbertson.

The head is most remarkable, so far as can be ascertained, for the possession of the full or normal number of molars, the great narrowness of the face, the large size of the auditory bullæ, and the prolongation of the technical angle of the lower jaw into a hook, an approach in resemblance to which among existing Ruminants we find in the Camel.

AGRIOCHŒRUS ANTIQUUS. *Leidy.*

An extinct species and genus of Ruminants, which is one of the lost links of the wide interval between existing members of the family and the very aberrant form, the extinct Amplotherium, *Cuvier*, of the tertiary formations of Europe and Asia.

It was established in the Proceedings of the Academy of Natural Sciences, vol. v., p. 121, for 1850, upon the anterior portion of a skull, containing in both jaws nearly all the molars received for examination from the Smithsonian Institution.

The molar teeth are decidedly constructed upon the same pattern as those of modern Ruminants, and the true molars are most like those of the extinct Merycopotamus, *Falconer* and *Cautley*, of the Sivalik Hills of India. The orbits, however, are not closed behind, as in the latter and existing Ruminants, but are open, as in Anoplotherium.

ARCHÆOTHERIUM ROBUSTUM. *Leidy.*

Arctodon: Proc. Acad. Nat. Sci., vol. v., p. 278.

This second species of Archæotherium is founded upon several fragments of molar teeth, and the crown of a canine which belonged to a larger animal than the Archæotherium Mortoni. The portions of teeth resemble so much those corresponding to them in the Bear, that I thought they certainly belonged to a closely allied genus, but was undeceived by an examination of the very beautiful specimen of a head containing nearly all the molars of Archæotherium Mortoni, in the collection of Dr. Owen.

ANCHITHERIUM BAIRDII. *Leidy.*

Palæotherium Bairdii: Proc. Acad. Nat. Sci., vol. v., p. 122.

Cuvier described the remains of a pachydermal quadruped, which he named Palæotherium aurelianense. This has since been certainly determined by the researches of Lartet, De Christol, and Pomel, to be a solipedal animal, for which the generic name of Anchitherium had been proposed by Von Meyer, and the species should therefore be named Anchitherium aurelianense. Among the remains of Mammalia from Nebraska, loaned to me for examination by the Smithsonian Institution, is the greater portion of a cranium, and fragments of jaws, containing full series of both upper and lower molar teeth, and a first phalanx.

The latter undoubtedly indicates a solipedal animal, and the molar teeth have the exact construction of those of Anchitherium aurelianense, to which, in comparison, the Anchitherium Bairdii was about three-fifths the size.

TESTUDO LATA. *Leidy.*

Proc. Acad. Nat. Sci., vol. v., p. 173.

This, the largest of the fossil Turtles from Nebraska, was established upon a specimen consisting of the greater portion of a carapace and sternum, in the collection of the Smithsonian Institution. It has been about two feet in length, twenty inches in breadth, and about nine inches in height.

TABLE IX.

REMAINS OF THE RHINOCEROS AND THE GIGANTIC PALÆOTHERIUM OF THE EOCENE TERTIARY OF THE MAUVAISES TERRES OF NEBRASKA.

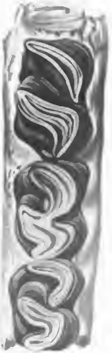
Tab. IX., Fig. 1. *Rhinoceros occidentalis.* Half the diameter of nature. Inferior view of the skull. Upon the left side all the molar teeth except the first are perfect, and the latter are entire on the opposite side.

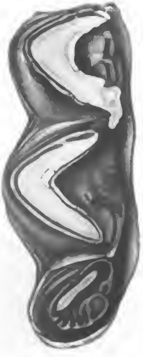
" Fig. 2. Fragment of the left side of the lower jaw, the size of nature, of *Rhinoceros occidentalis.* It contains three molar teeth.

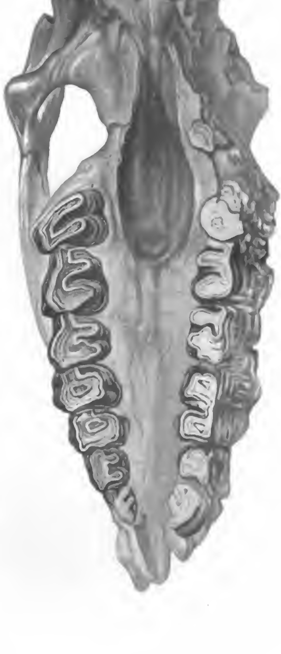
" Fig. 3. The last lower molar tooth of the left side of *Palæotherium* (*Titanotherium*) *Proutii*, the size of nature.

" *a.* Left side of the lower jaw of *Palæotherium* (*Titanotherium*) *Proutii*, reduced one diameter, containing the true molars, and portions of the preceding two premolars.

The Palæotheroid animals are more nearly allied to the Tapir than any other living animal, but approximate in some respects to the Rhinoceros.







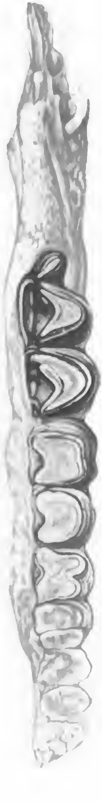


TABLE X.

REMAINS OF ARCHÆOTHERIUM AND OREODON OF THE EOCENE TERTIARY OF NEBRASKA.

Engraved from Daguerreotypes of the Original Specimens.

Tab. X. Fig. 1. Inferior view of the upper jaw of *Archæotherium* (*Entelodon?*) *Mortoni*, one-half the diameter of nature. Upon the upper side of the figure may be observed the last two temporary molars, and the succeeding two permanent molars, and on the lower side the permanent premolar successors of the former teeth, and the following two true molars.

" Fig. 2. Side view of the head of *Archæotherium* (*Entelodon?*) *Mortoni*, reduced two diameters. In it are visible the posterior two temporary molars, and the first and second permanent true molars.

The lower jaw exhibits a portion of the unprotruded last permanent premolar, a fragment of the last temporary molar, and the first permanent true molar.

" Fig. 3. Portion of the left side of the lower jaw of *Archæotherium* (*Entelodon?*) *Mortoni*, reduced one diameter. It contains a portion of the last temporary molar, below which, in the figures, the unprotruded last permanent premolar is partially visible, and the permanent true molars.

Since writing the descriptions accompanying these plates, on the mammalian and chelonian remains of Nebraska, I have had an opportunity of inspecting Gervai's Palæontologie Françaises, in which is the sketch of an upper series of molar teeth of Entelodon, which so closely correspond to those of Archæotherium, that I think it very probable the latter may prove to belong to the same genus.

" Figs. 4–6. *Oreodon Culbertsonii*, reduced one diameter.

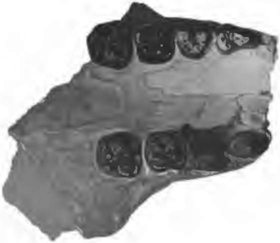
" Fig. 4. Inferior view of the skull, of a male individual, containing on both sides the molar series, almost perfect, the left canine tooth entire, and part of the right canine.

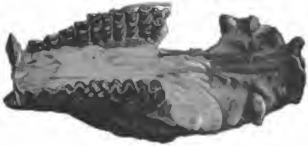
" Fig. 5. Side view of the skull, with the lower jaw, of a female individual. It contains all the molar teeth in both jaws, and the canines in the lower jaw.

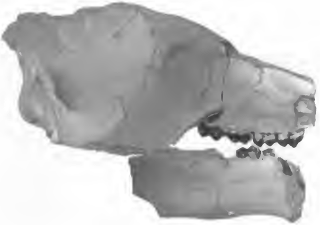
" Fig. 6. Upper view of the skull of the same individual as the last.

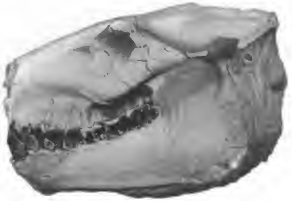
The Archæotherium partook of the nature of the Hog and Peccary. Yet, by regarding its physiognomy, it will be observed that the animal must have had more decided carnivorous propensities than those pachyderms; indeed, in the greater size of the temporal fossæ and high sagittal crest, this fossil genus of Nebraska, approximated to the Cat tribe; and it is probable, when its canine teeth are discovered, that they will be found to have an analogy with the plantigrade or Bear tribe. Thus we have united in this singular extinct race characters witnessed now in two different orders.

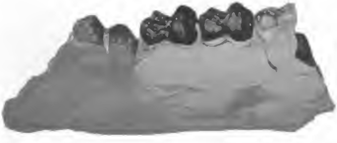
The Oreodon was truly a ruminating Hog; its grinding teeth closely analogous to the Deer tribe, show that it chewed the cud like existing Ruminants, yet was provided with very peculiar canines, more like those of the Peccary than any other existing animal; while some portions of the cranium approach to the Camel and Lama. It possesses incisors in both jaws, differing in this respect from all existing Ruminants.











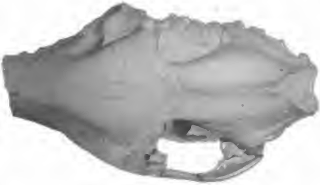


TABLE XI.

ADDITIONAL REMAINS OF ARCHÆOTHERIUM AND OREODON.

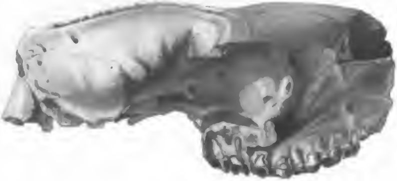
All the figures of the natural size.

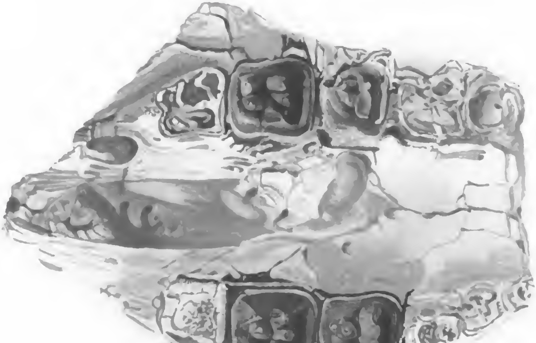
Tab. XI, Fig. 1. Inferior view of the upper jaw of an adult individual of *Archæotherium* (*Entelodon?*) *Mortoni*. The left side of the specimen contains the first and second true molars, perfect, and the fangs of the last molar and of the preceding two premolars. The right side contains the greater part of the first true molar, the entire second, and the fangs of the third and those of the last premolar.

" Figs. 2, 3. *Oreodon gracilis*.

" Fig. 2. View of the right side of the skull of an adult individual.

" Fig. 3. View of the base of the same specimen. Upon the left side are exhibited the fourth premolar and the true molars, nearly entire.





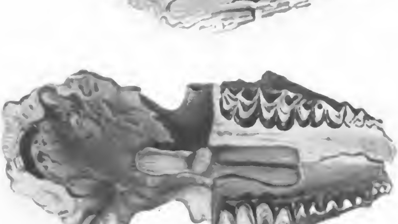


TABLE XII

REMAINS OF A SPECIES OF LAND TURTLE, FROM THE EOCENE TERTIARY OF NEBRASKA.

Engraved from Daguerreotypes of the Original Specimen.

Tab. XII., *Testudo Culbertsonii*, two-fifths the diameter of nature.
" Fig. 1. Ventral view. Sternum.
" Fig. 2. Dorsal view. Carapace.

The anterior part of both figures is directed to the left of the engraving.

Though the fossil turtles of the Mauvaises Terres of Nebraska, have most analogy, in the details of the anatomy of the carapace, to the land tortoises, still their general form and appearance closely approximate to the aquatic turtles, and for this reason it is not improbable that they were partly aquatic in their habits.

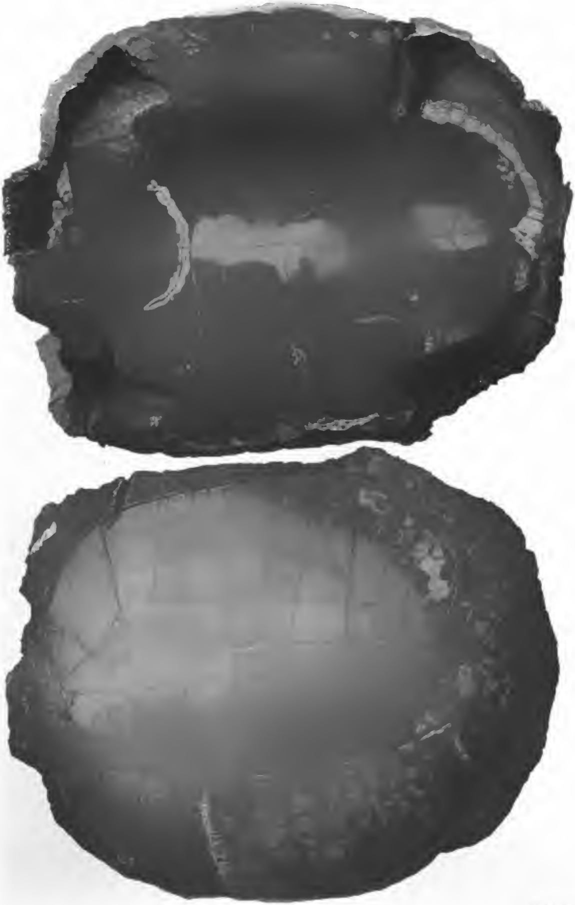


TABLE XII.

A.

TWO SPECIES OF LAND TURTLES, MACHAIRODUS, OR SABRE-TOOTHED TIGER, AND A SMALL SPECIES OF RHINOCEROS, FROM THE EOCENE TERTIARY OF NEBRASKA.

Engraved from Daguerreotypes of the Original Specimens.

Tab. XII. A, Figs. 1, 2. *Testudo Nebrascensis*, half the diameter of nature.
" Fig. 1. Dorsal view. Carapace.
" Fig. 2. Ventral view. Sternum.
" Figs. 3, 4. *Testudo Oweni*, three-tenths the diameter of nature.
" Fig. 3. Dorsal view. Carapace.
" Fig. 4. Ventral view. Sternum.
" Fig. 5. View of the left side of the skull and lower jaw of *Machairodus primævus*, two-fifths the diameter of nature. In the upper jaw are visible a portion of the canine, and the posterior three molars.
" Fig. 6. *Rhinoceros Nebrascensis*, two-fifths the diameter of nature. Inferior view of the upper jaw, containing the series of molars on both sides, nearly perfect.

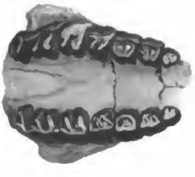


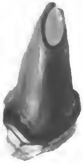
TABLE XII

B

REMAINS OF A LAND TURTLE, RHINOCEROS, AND PALÆOTHERIUM, FROM THE EOCENE TERTIARY OF NEBRASKA.

Engraved from Daguerreotypes of the Original Specimens.

Tab. XII. B, Figs. 1, 2. *Testudo hemispherica*, one-third the diameter of nature.
" Fig. 1. Right dorso-lateral view.
" Fig. 2. Right ventro-lateral view.
The anterior part of both figures is directed to the right of the engraving.
" Figs. 3, 4. Fragments of the superior true molars, natural size.
I am at present very much inclined to consider these as belonging to a true species of Palæotherium, which from its very great size might be appropriately named Palæotherium maximum.
" Fig. 5. Fragment of the lower jaw of *Rhinoceros Nebrascensis*, the size of nature. It contains half of the first true molar, and both those succeeding, entire.
" Figs. 6–8. *Palæotherium* (*Titanotherium*) *Proutii*, the size of nature.
" Fig. 6. Fragment of the masticating surface of a superior true molar, exhibiting the inner conical lobe.
" Fig. 7. Crown of an inferior premolar.
" Fig. 8. Crown of an inferior canine.
Figs. 6–8, and figs. 3, 3 *a*, Tab. IX., I think belong to a different but closely allied genus to those represented in figs. 3 and 4 of this plate, which appear to be characteristic of a true Palæotherium.



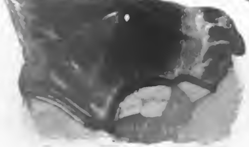


TABLE XIII.

REMAINS OF ARCHÆOTHERIUM AND OREODON, FROM THE EOCENE TERTIARY OF NEBRASKA.

The figures are all of the natural size.

Tab. XIII., Fig. 1. Distal extremity of an os humeri, viewed anteriorly.

“ Fig. 2. The same specimen as Fig. 1, articulated with the radius and ulna, viewed internally.

None of the specimens of long bones in the collection, were found in immediate connexion with the fragments of crania, so that I am not able to ascertain with certainty to what species those represented belong. The humerus of Figs. 1 and 2 is about the same size as the corresponding portion of that of Cervus Virginianus; the radius is in a trifling degree larger, but the ulna is relatively much better developed. The relative size of the three bones agrees better with the Suilline animals than with Ruminants, and they may probably belong to Archæotherium Mortoni.

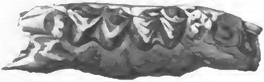
“ Fig. 3. Fragment of the left side of the lower jaw of Oreodon Culbertsonii, viewed from above, and exhibiting the true molars and the posterior two premolars, with their crowns very much worn.

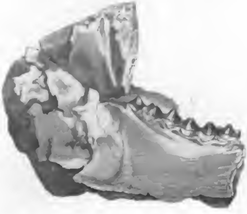
“ Fig. 4. Fragment of the lower jaw of Oreodon Culbertsonii, exhibiting the triturating surfaces of the last two molars.

“ Figs. 5, 6. Fragment of the right side of the lower jaw of Oreodon gracilis, containing the last two molars, and half of that in advance.

“ Fig. 5. External view of the specimen.

“ Fig. 6. View of the triturating surfaces of the teeth.





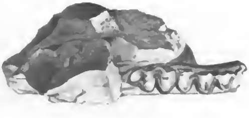
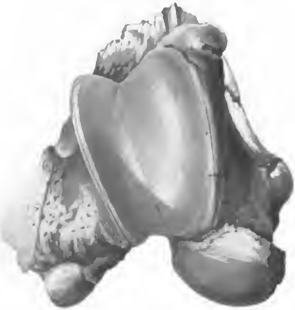


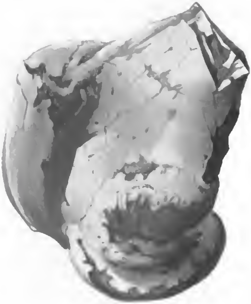
TABLE XIV.

REMAINS OF THE RHINOCEROS, FROM THE EOCENE TERTIARY OF NEBRASKA.

All the figures reduced one-third.

Tab. XIV., Fig. 1. Front view of the distal extremity of the os femoris, supposed to belong to Rhinoceros occidentalis.
" Fig. 2. Inner view of the same specimen.
" Fig. 3. The left tibia, probably also of the same species, though the specimen is relatively rather smaller than the former.





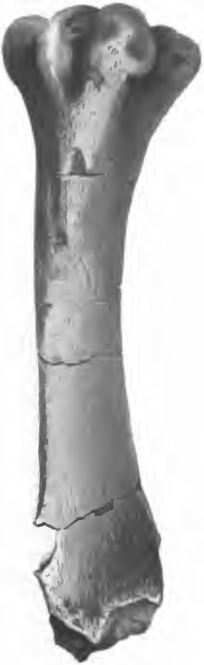


TABLE XV.

REMAINS OF EUCROTAPHUS AND OF THE RHINOCEROS, FROM THE EOCENE TERTIARY OF NEBRASKA.

All the figures are of the natural size.

Tab. XV., Fig. 1. View of the left side of a cranial fragment of Eucrotaphus auritus.
" Fig. 2. Upper view of the same fragment.
" Fig. 3. Portion of the right side of the lower jaw, containing the posterior three molars, of Rhinoceros Nebrascensis.
" Fig. 4. View of the proximal articulation of the tibia, supposed to be of Rhinoceros occidentalis.

The Eucrotaphus was a fossil ruminating Pachyderm, allied to the Oreodon, a ruminating Hog, whose analogies have been mentioned in the references to Table X.

Fremu

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